

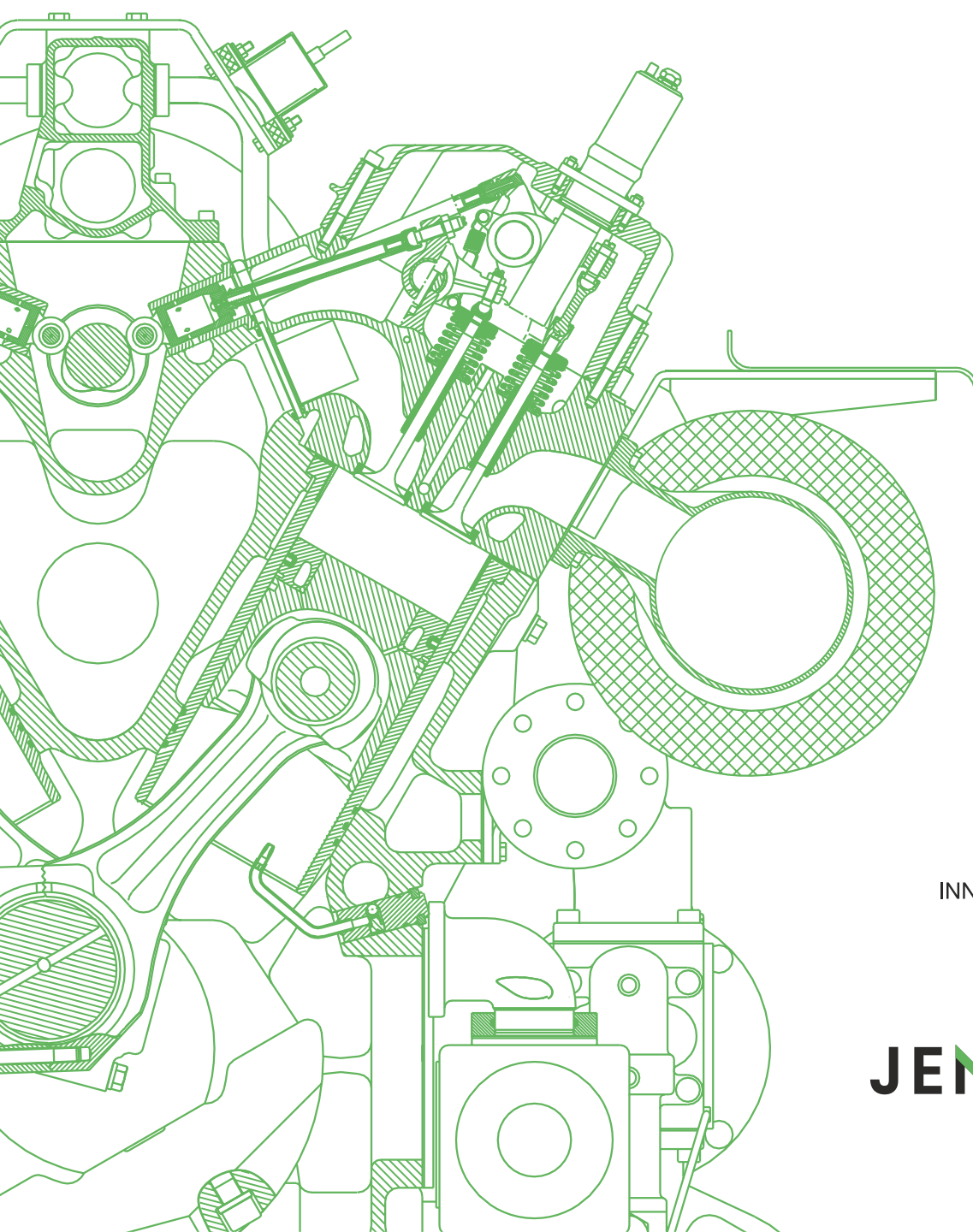


ST-139

Service Technician Instruction

Combustion chamber

Guideline for inspections



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1	Scope	1
2	Purpose	1
3	Additional information	1
4	Potential combustion chamber appearance	2
4.1	Local liner polishing and/or pistons with noticeably black edges/carbon deposits	2
4.2	Slight scoring	3
4.3	Localised ring scuffing	3
4.4	Ring scuffing	4
4.5	Piston seizure	4
4.6	Sticking valve striking the piston crown	5
4.7	Burnt-through prechamber tips	5
5	Piston cleaning	6
6	Revision code	6

The target recipients of this document are:

Service Partners, Commissioning Partners, Subsidiaries/Branches, Location Jenbach

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1 Scope

This Service Technician Instruction (ST) applies to the following Jenbacher* gas engines:

- Type 6 equipped with steel pistons

2 Purpose

This Service Technician Instruction provides change criteria guidance of which parts require replacement in case of combustion chamber issues as it has become apparent that engine parts (liners, piston rings and pistons) have been replaced during combustion chamber inspections when it was not necessary to do so.



In the event of reduced oil filter lifetime, reduced oil lifetime, high oil consumption, reduced blow-by filter lifetime, detected knocking, it is recommended to log a case with all the relevant information in the Jenbacher Case Management System, so it can be reviewed and the next steps defined.

3 Additional information

When working on Jenbacher modules, all applicable local regulations must be observed in addition to our documentation. In relation to this Service Technician Instruction we stress the fact that the following documents must also be observed:

- Technical Instruction TA 1100-0111: General conditions – Operation and maintenance
- Technical Instruction TA 1400-0170: Pistons, conrods, cylinder liners – Replacement J624
- Technical Instruction TA 1400-0171: Steel pistons, conrods, cylinder liners – Replacement J612-J620
- Technical Instruction TA 1400-0176: Cleaning the piston groove for Type 6 engines
- Technical Instruction TA 2300-0001: Employee protection
- Technical Instruction TA 2300-0005: Safety regulations
- Maintenance Instruction W 0501 M6: Prechamber/prechamber gas valve

4 Potential combustion chamber appearance

4.1 Local liner polishing and/or pistons with noticeably black edges/carbon deposits

LINER POLISHING:

No honing marks can be recognised any more where the liner is polished.

OIL VARNISH:

Oil varnish can occur in all gas engines to a greater or lesser intensity, which depends on a number of factors such as the fuel gas, mode of operation, oil type, etc. Oil varnish is not critical and is harmless provided the honing is still discernible. Oil varnish provides a level of wear protection for friction partners to a certain extent. Consequently, there is no need to undertake anything if oil varnish is present.



Figure 1: Potential combustion chamber appearance

- ① Localised **liner polishing** with
- ② **Oil varnish** in the liners



Figure 2: Potential combustion chamber appearance

- ① Localised **liner polishing** with
- ② **Oil varnish** in the liners

BLACK CARBON DEPOSITS ON THE PISTON:

In almost all cases the piston crown is covered with medium to light-grey oil deposits, almost white in places. If individual pistons have very dark, almost black, deposits around the edge, it can be assumed that they push oil upwards during operation, which results in these dark deposits. The increased "oil pushing" should not be confused with the fact that with steel pistons in particular with their lower top lands, wet oil areas can be seen on the light-coloured deposits after a shutdown. This is not unusual and is quite harmless.

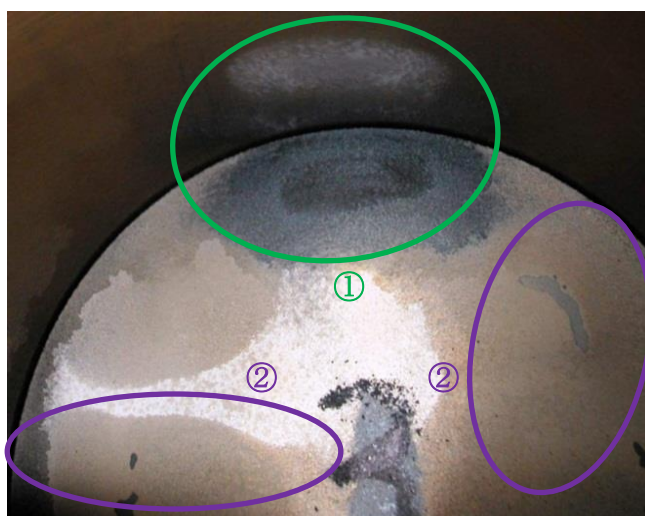


Figure 3: Potential combustion chamber appearance

- ① **Dark piston crown**
- ② **Wet oil areas on light-coloured deposits**



Figure 4: Potential combustion chamber appearance

- ③ **Coked ring land**

4.2 Slight scoring

Superficial scuff marks may be caused by small particles which came between a piston ring and the cylinder liner. That can happen during the assembly process. Typical for this type of scuffs is a superficial surface “damage” while the honing marks remain visible. Cylinder liners with this type of scuff marks do not need to be replaced (cylinder liner/piston rings) because the function is not affected.

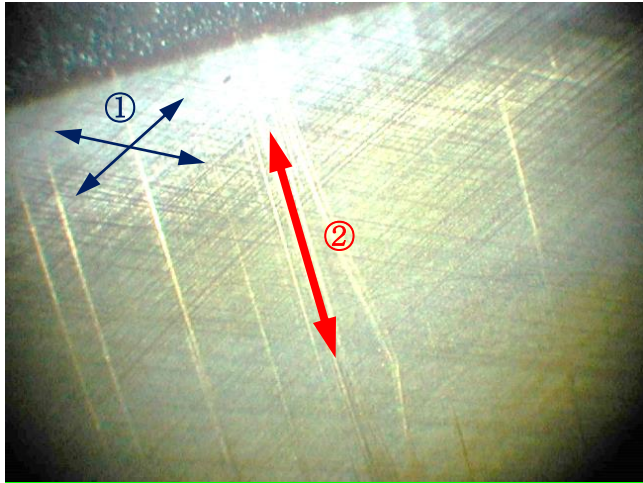


Figure 5: Slight scoring

- ① Honing
- ② Piston movement

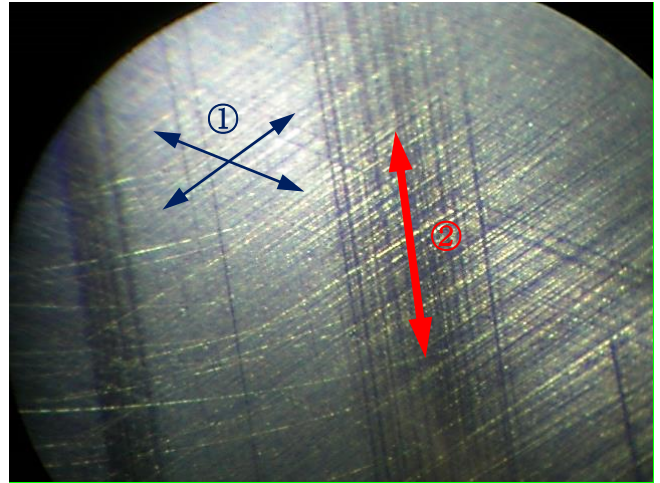


Figure 6: Slight scoring

- ① Honing
- ② Piston movement

Dirt scoring could be occurred during assembly process at site or in the factory.

4.3 Localised ring scuffing

Please remember that in most cases the pistons will be undamaged, in which case they are allowed to be reused as long as honing mark is visible.



Figure 7: Localised or all-round circumferential scuffing

4.4 Ring scuffing

Ring scuffing (not to be confused with dirt scoring = narrow scratches) is the term given to local areas of friction marks where the honing pattern is no longer visible. If the honing pattern is still visible, the mark has in all probability little or no effect on the blow-by volume. The description of the piston crown given above (black colouration around the edge) can be relevant in this case as well. If there is no black colouration of the piston crown, no immediate action needs to be taken if honing marks are still visible.



Figure 8: Slight piston ring scuffing

① Honing is no longer visible in this area

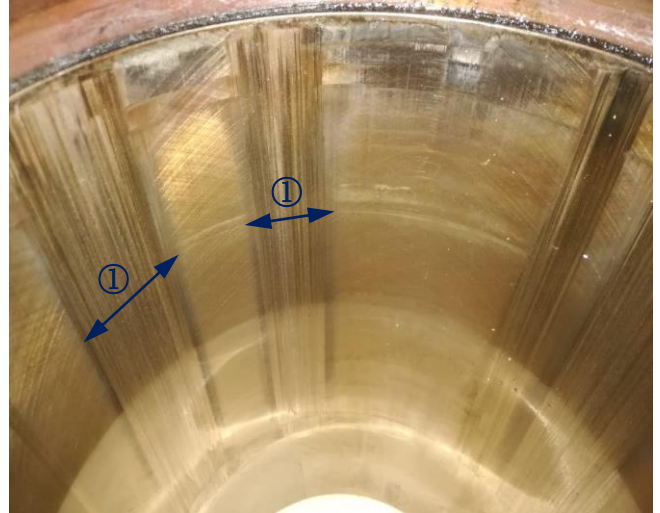


Figure 9: Average piston ring scuffing

① Honing is no longer visible in this area

4.5 Piston seizure

Replace the affected cylinder liner, piston, piston pin, piston rings, conrod and big-end bearing. This is the most severe form of rubbing. In such case, not only the piston rings but the entire piston has rubbed and seized. The cylinder head must be checked and replaced if necessary.



Figure 10: Piston seizure

4.6 Sticking valve striking the piston crown

In a few extreme cases sticking valves have struck the crown of steel pistons. Due to the steel piston design, these impacts occur near the centre of the piston crown. This is exactly where the central thread is located that joins the piston crown to the skirt. Consequently, there is a possibility that the valve impacts can loosen this screw joint, which means that the piston crown becomes loose on the piston skirt. If there are impact marks of this kind made by the valve head striking the piston crown, the entire affected piston must be replaced complete with its rings.



Figure 11: Valve head impact marks on a piston crown

The position to the diameter is always the same but the circular position can vary, as the piston crown may already have rotated under the impact of the valve.

4.7 Burnt-through prechamber tips

In a few cases prechambers have been found that had a burnt-through tip. In such a case the piston may be affected as well. Replace the prechamber and follow the inspection and replacement interval as per W 0501 M6. In most cases the root cause for such prechamber tip failures may be lack of maintenance and/or not following check and change intervals as well as potentially wrong engine setup in few cases.



Figure 12: Burnt-through prechamber tip



Figure 13: Burnt-through prechamber tip

5 Piston cleaning



Regarding the cleaning of piston ring grooves, please observe TA 1400-0176.

6 Revision code

Index	Date	Description / Revision summary
4	18.07.2019	Implemented some revised contents from ST-059 and ST-153; Rebranded the document from GE to INNIO Jenbacher; Adapted the structure as per standard of the Jenbacher Documentation Department
03	28.04.2017	Cleaning of the piston ring grooves according to the new Technical Instruction TA 1400-0176
02	18.03.2014	Adapted to match the new Service Technician Instruction ST-153
01	10.07.2013	First version of this document

Table 1: Revision history

*Indicates a trademark